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September 30, 2013

Mr. Glen Laube
City of Chula Vista
Planning and Building Department
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Chula Vista, CA 91910

Reference: Year 2 Annual Report for the Otay Tarplant and San Diego Thornmint Restoration and Enhancement Program (SANDAG Grant Number 5001590; RECON Number 5662)

Introduction

This second annual report provides background information and summarizes the tasks performed during the second year (September 2012 to August 2013) of the Otay tarplant (*Deinandra conjugens*) and San Diego thornmint (*Acanthomintha ilicifolia*) restoration and enhancement program in the Chula Vista Central City Preserve. Three quarterly reports have previously been prepared by RECON. The information from these reports is summarized below for tasks completed between September 1, 2012 and August 31, 2013. This annual report also summarizes the results of the relevé vegetation surveys that were conducted in spring 2013 at the treatment sites, as well as the population estimates for Otay tarplant and San Diego thornmint.

The Central City Preserve is in the central portion of the city of Chula Vista, east of Interstate 805, south of State Route 54 and Bonita Road, and north of Otay Lakes Road (Figure 1; see Attachment 1 for all figures and photographs). The Central City Preserve covers approximately 1,350 acres and is subdivided further into four Preserve Management Areas (PMAs) for data management purposes and the development of the Area Specific Management Directives that were prepared in 2004 (Figure 2). Each PMA consists of a number of open space areas, referred to as subunits, which are surrounded by residential development. Each of these subunits was assigned a number to organize and distinguish each distinct survey area (Figure 3). Restoration and enhancement work was performed in PMA 1 subunits 1-1a, 1-1c, and 1-2b. The treatment areas in these three subunits are shown in Figure 3.

Otay Tarplant Status and Conservation

Otay tarplant is federally listed threatened, state listed endangered, and considered a narrow endemic species under the City of Chula Vista Multiple Species Conservation Program (MSCP) Subarea Plan (City of Chula Vista 2003; Photograph 1). It also has a California Native Plant Society (CNPS) Rare plant ranking of 1B.1 (Rare, threatened, or endangered in California and elsewhere; seriously endangered in California) (CNPS 2012). Populations of Otay tarplant are substantially declining throughout San Diego County. Extant populations are threatened by pressures from urban development, habitat disturbance, and invasion of non-native species.

San Diego Thornmint Status and Conservation

San Diego thornmint is federally listed threatened, state listed endangered, and considered a narrow endemic species under the City of Chula Vista MSCP Subarea Plan (City of Chula Vista 2003; Photograph 2). It also has a CNPS Rare plant ranking of 1B.1 (Rare, threatened, or endangered in California and elsewhere; seriously endangered in California) (CNPS 2012). Populations of San Diego thornmint are substantially declining throughout San Diego County. Extant populations are threatened by pressures from urban development, habitat disturbance, and invasion of non-native species, with as many as one-third of historical occurrences believed to be extirpated (CNPS 2012). San Diego thornmint is restricted to clay lens microhabitats, which limits the establishment of new populations due to the lack of such habitat remaining in San Diego (Reiser 2001).

Project Goals and Habitat Restoration Methods

- Restore native grassland and clay lens habit habitat for Otay tarplant, San Diego thornmint, and other MSCP-covered species, including variegated dudleya (*Dudleya variegata*; Photograph 3) and small-flowered morning glory (*Convolvulus simulans*; Photograph 4) in areas currently dominated by weeds.

- Increase the size of Otay tarplant and San Diego thornmint populations.

- Reduce competition with non-native weeds that are invading the native grassland habitat and degrading the rare plant habitat by controlling annual non-native grasses and perennial weed species such as fennel (*Foeniculum vulgare*) and artichoke thistle (*Cynara cardunculus*).

- Increase native grassland habitat by planting purple needlegrass (*Stipa* [=*Nassella*] *pulchra*) in areas currently dominated by non-native grasses and other weeds.

2012–13 Rainfall Summary and Ecological Effects

Between July 1, 2012 and June 30, 2013 (the official rainy season), rainfall in Chula Vista (6.26 inches) was below normal (which is approximately 10 inches) (Table 1). Significant fall rains began in December 2012, when nearly 2.50 inches of rain fell during that month. This heavier than normal rain episode was followed by slightly below normal rainfall in January 2013 and well below normal rainfall in February through the rest of the season 2013, with less than an inch in each of those months

The rains in December 2012 triggered the germination of non-native weeds such as annual grasses, black mustard (*Brassica nigra*) and tocalote (*Centaurea mellitensis*). A more detailed description of weed control efforts is given in the maintenance section below. Weed control efforts, changes observed in the native plant growth, and monitoring results were documented through photographs taken at the restoration and enhancement sites.

TABLE 1
SUMMARY OF RAINFALL DATA BY MONTH AT CHULA VISTA
JULY 1, 2012 – JUNE 30, 2013

Month	Monthly Rainfall (inches)
July	0.00
August	0.02
September	0.00
October	0.22
November	0.19
December	2.44
January	1.64
February	0.53
March	0.95
April	0.11
May	0.16
June	0.00
TOTAL PRECIPITATION	6.26 inches

Year 2 Tasks Performed September 2012 through August 2013

Seed Collection/Redistribution

Fall 2012 Seed Dispersal

In order to start new populations of San Diego thornmint, a portion of the seed collected in 2011–12 was dispersed by RECON biologists in early December 2012 at seven new locations in PMA subunits 1-2b, 1-1a, and 1-1c. The thornmint seeding areas were small experimental sites (Photograph 5). After significant rains, San Diego thornmint seeding areas were monitored to determine if germination had occurred, observe the health of the plants, and determine when weeding of the seeded plots needed to be performed. The newly germinated thornmint seedlings were visible in January 2013 after the heavy rains that occurred in December 2012 (Photograph 6). A more detailed discussion of the seasonal growth and flowering of San Diego thornmint is included in the Discussion section below.

2013 Seed Collection and Dispersal

Germination, seed development, and overall health of Otay tarplant and San Diego thornmint were monitored during the site visits to determine the correct timing for seed collection. In May 2013, RECON biologists collected San Diego thornmint seed for redistribution in the fall of 2013. As a standard conservation measure, no more than 5 percent of the total Otay tarplant and San Diego thornmint seed crop was collected. In August 2013 additional Otay tarplant seed was collected and dispsersed (Photograph 7). Other previously collected native plant seed including western blue-eyed-grass (*Sisyrinchium bellum*), osmadenia (*Osmadenia tenella*), purple needlegrass, foothill needlegrass (*Stipa lepida*), variegated dudleya, and shooting star (*Dodecatheon clevelandii*) were redistributed in PMA subunits 1-1a and 1-2b.

Preserve Sign Installation

RECON biologists monitored the installation of signs that identify the area as sensitive rare plant habitat and direct the public not to enter the area (Photographs 8–9). The protective fencing, installed earlier in 2012, has remained intact.

Maintenance

Weed Control

Two general methods of weed treatment have been used in the restoration and enhancement areas. In areas occupied by natural populations of San Diego thornmint, only dethatching by weed whips and thatch removal was conducted (in 2011). Areas with Otay tarplant only (with no thornmint) were dethatched also in fall of 2011 and follow-up spraying of weeds was done in 2012 and winter/spring 2013. In some areas where there were high concentrations of native bulbs, weed whips were used to cut non-natives around the bulbs to avoid spraying those areas (Photograph 10).

During the fall of 2012 through spring of 2013 RECON biologists checked the status of weeds within treatment areas to determine the schedule for the restoration crew to conduct herbicide treatment. Early light rains in October and November caused the germination of non-native grasses and herbs in small numbers, but the cool dry weather into early December limited their growth. As mentioned above, heavier than normal rain occurred in mid-December 2012, which caused additional weeds to germinate. In February 2013, prior to spraying, RECON biologists flagged sensitive resources, such as Otay tarplant and San Diego thornmint seedlings, variegated dudleya, and areas with large populations of native bulbs, annuals, and grasses for avoidance (Photograph 11).

Annual weeds were sprayed by RECON crews beginning in early February and continuing in March and April 2013 to prevent them from flowering and setting seeds (Photographs 12–13). Transline was used to control the artichoke thistle, and Prosecutor (glyphosate) was used to control all other weed species. RECON biologists monitored the crew during herbicide application. Both herbicides are approved for use in natural areas by the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) and were applied by licensed applicators under the direction of RECON Field Director Ruth Vallejo. Herbicide was used when there was little to no wind present to avoid overspray that may harm native plants. Non-native species that were controlled included black mustard, tocalote, fennel, artichoke thistle, and annual grasses such as wild oats (*Avena* spp.) and Italian rye grass (*Festuca perennis* [=*Lolium multiflorum*]).

Native Grass Planting.

Approximately 6,000 purple needlegrass individuals were planted within the three PMA subunits 1-1a, 1-1c, and 1-2b (Photographs 14–15). The plants were distributed in approximately the following amounts: subunit 1-1a 1,000 plants, 1-1c 400 plants, and 1-2b (the Rice Canyon subunit) 4,600 plants. The grasses were planted in mid-January 2013 after seasonal rains had moistened the soil and additional rainfall was anticipated (Photographs 16–17). Planting holes were excavated for each plant that had been grown in a rose pot. Due to the difficult access to the planting site, the newly planted grasses were not irrigated. However, to give the plants the best chance of survivorship, they were thoroughly watered at the nursery prior to delivery to the site. Additional natural rainfall (over 1.25 inches) occurred about one week after the grasses were planted. This beneficial rain settled the soil around the newly planted grasses and charged the soil so that the plants could become established (Photograph 18).

Monitoring Methods

2013 Sensitive Plant Population Estimates

Following the second year of follow-up weed control, San Diego thornmint population counts were conducted in April 2013, and Otay tarplant population estimates were completed in late May 2013. Population counts were conducted after it was determined that the maximum number of individuals had emerged for the season and when the majority of the plants were still in flower (Photographs 19–20). In small patches (population in the hundreds), Otay tarplant and San Diego thornmint were counted individually. In large patches (population in the thousands), individuals

were counted in sample sub-plots, and then population numbers were estimated based on the size of the patch and the average density within the sub-plots. Population counts were conducted by RECON biologists Anna Bennett and JR Sundberg using these methods.

Relevé Vegetation Sampling Methods

Vegetation patch sampling was done using the relevé method. All plant species occurring in each patch were recorded, and the cover of species was estimated. A total of 22 vegetation treatment areas were sampled by RECON biologist Anna Bennett in April 2013. Study plots were located in two types of treatment areas: (1) 19 study plots were dethatched and treated with herbicide and (2) three study plots were dethatched only (in areas supporting natural populations of San Diego thornmint). The results of the vegetation sampling efforts are presented in the Results section below.

Results

2013 Otay Tarplant and San Diego Thornmint Population Estimates

The results of the 2013 population counts by PMA subunit are shown in detail in Table 2. In the three PMA subunits there were 154,201 Otay tarplants, 13,240 San Diego thornmint and 1,127 variegated dudleya (Figures 4a–4c).

TABLE 2
NUMBER OF OTAY TARPLANT, SAN DIEGO THORNMINT, AND VARIEGATED DUDLEYA INDIVIDUALS BY PRESERVE MANAGEMENT AREA SUBUNIT 2013

Species	PMA 1-1a	PMA 1-1c	PMA 1-2b	Total
		2013		
Otay tarplant	19,817	1,961	132,423	154,201
San Diego thornmint	322*	350*	12,568**	13,240
Variegated dudleya	0	0	1,127	1,127

*Introduced population
**1,025 of the 12,568 were in newly seeded areas.

Year 2 Vegetation Relevé Sampling Results

A total of 43 native and 29 non-native species were recorded in PMA 1-1a; 31 native and 30 non-native species were recorded in PMA 1-1c; and 49 native and 41 non-native species were recorded in PMA 1-2b. Attachment 2 lists the species observed within the restoration and enhancement areas during the relevé sampling. The results of the 2013 relevé surveys are discussed in further detail below. Table 3 lists the results from the 19 treatment areas that were dethatched and spot sprayed with herbicide. Table 4 lists the results from the three treatment areas that were only dethatched. Some representative native plant associates of Otay tarplant and San Diego thornmint observed during the growing season are shown in Photographs 21–29.

TABLE 3
TREATMENT—DETHATCH AND SPRAY

Vegetation Type	Absolute	Relative (Vegetation only)
Average total cover (shrub & herbaceous)	36%	100%
Average native cover	17%	48%
Average non-native cover	18%	52%
Average native grass cover	6%	16%
Average bulb cover	4%	11%
Average shrub cover	4%	10%
Average bare ground	64%	-

TABLE 4
TREATMENT—DETHATCH ONLY

Vegetation Type	Absolute	Relative (Vegetation only)
Average total cover (shrub & herbaceous)	57%	100%
Average native cover	29%	52%
Average non-native cover	28%	48%
Average native grass cover	3%	7%
Average bulb cover	7%	13%
Average shrub cover	4%	8%
Average bare ground	43%	-

Discussion

Weed Control Results

At the start of the project in October 2011, a total of approximately 17.07 acres of dried weedy areas were dethatched using weed whips. All treatments areas were dethatched during the site preparation phase. Two different treatments were used for weed control efforts: (1) dethatching and treatment with herbicide and (2) dethatching and no herbicide use (bulb concentration and thornmint areas). By the end of April 2013, a total of approximately 14.39 acres had been treated with herbicide.

In the dethatch/spray treatment areas, the absolute cover of non-natives was 18 percent compared to 28 percent in the dethatch only treatment areas. The higher cover of non-natives was expected in the dethatch only areas, since follow-up spraying was not performed in those areas occupied by San Diego thornmint.

Bulb and shrub cover was similar for the two treatment types both in absolute and relative terms (see Tables 3 and 4). Absolute cover of native species was higher (29 percent) in dethatch only areas compared to dethatch and spray areas (17 percent native cover). Native cover at the treatment sites, both sprayed and not sprayed, showed high variability ranging from as low as 1 percent cover to as high as 36 percent. This may be a reflection of past disturbance and previous levels of weed invasion that had crowded out native species.

Although a quantitative assessment of non-native cover was not performed prior to the implementation of the project due to budget limitations, anecdotal observations and pre-implementation photographs indicate that non-native cover was very high, likely in the order of 75–80 percent if not higher at some locations.

Comparing the 2013 results to 2012 (Year 1) data, non-native cover in the dethatch and spray areas decreased from 26 percent absolute cover in 2012 to 18 percent in 2013. Relative cover of non-natives also decreased in the dethatch and spray areas, from 62 percent in 2012 to 52 percent in 2013. Native cover increased from 15 percent absolute cover in 2012 to 17 percent in 2013, and the relative cover of natives also increased from 37 percent in 2012 to 48 percent in 2013. Photographs 30–31 show one of the Rice Canyon (PMA subunit 1-2b) dethatch patches prior to dethatching in October 2011 (see Photograph 30) and after dethatching and 2 years of follow up weed treatment in June 2013 (see Photograph 31). The improvement in habitat quality at the site is evident from these photographs.

For the areas occupied by San Diego thornmint that were dethatched only, non-native cover also decreased. In 2012 absolute non-native cover was 39 percent and in 2013 it was 28 percent. Absolute native cover increased during that same time period from 24 percent in 2012 to 29 percent in 2013. The relevé results indicate that continued progress has been made on weed

control during the second year of the project. It is anticipated that native annual cover will continue to increase as seeds have now been dispersed into treatment areas.

Germination and Seasonal Growth of Sensitive Species

Otay tarplant and San Diego thornmint seedlings germinated during the heavy rainfall events in December 2012 and were visible in the field by early to mid-January 2013 (Photographs 32–33). Additional seeds of tarplant and thornmint germinated during a later rain event in late January when over 1.25 inches fell as evidenced by visibly different age classes of the plants (Photograph 34–35) and extended flowering times. Other sensitive species also responded to the heavy rains of December 2012 including small-flowered morning glory (Photograph 36) and variegated dudleya (Photograph 37). The flowering period for San Diego thornmint in 2013 started in March and ended in May (Photographs 38–39). Otay tarplant began flowering in April (Photograph 40) and continued into August.

Population Estimates

Table 5 compares the population counts from 2011 to 2013. The populations of Otay tarplant and variegated dudleya have increased each year from 2011 through 2013. San Diego thornmint increased in 2012 from the 2011 baseline condition, but the total population count decreased from 2012 to 2013. Although there was a year-to-year decrease in the number of thornmints from 2012 to 2013, the number of thornmint in 2013 still surpassed the 2011 baseline population by several thousand plants.

TABLE 5
NUMBER OF OTAY TARPLANT, SAN DIEGO THORNMINT, AND VARIEGATED DUDLEYA INDIVIDUALS BY PRESERVE MANAGEMENT AREA SUBUNIT 2011-2013

Species	PMA 1-1a	PMA 1-1c	PMA 1-2b	Total
2011				
Otay tarplant	7,107	92	33,731	40,930
San Diego thornmint	0	0	8,542	8,542
Variegated dudleya	0	0	15	15
2012				
Otay tarplant	11,930	297	125,323	137,550
San Diego thornmint	476*	140*	32,200	32,816
Variegated dudleya	0	0	75	75
2013				
Otay tarplant	19,817	1,961	132,423	154,201
San Diego thornmint	322	350	12,568	13,240
Variegated dudleya	0	0	1,127	1,127

*Introduced population

The baseline population estimate conducted prior to implementation in 2011 showed a total of approximately 40,930 Otay tarplant, 8,542 San Diego thornmint, and 15 variegated dudleya individuals. San Diego thornmint and variegated dudleya were only observed in PMA subunit 1-2b (Rice Canyon). Otay tarplant was found in all three PMA subunits (1-1a, 1-1c, and 1-2b).

In 2013 a total of 154,201 Otay tarplant, 13,240 San Diego thornmint, and 1,127 variegated dudleya individuals were estimated to be in the treatment areas (Photographs 41–43). The locations of the Otay tarplant, San Diego thornmint, and variegated dudleya populations are shown on Figures 4a through 4c. The small populations of thornmint in PMA subunits 1-1a and 1-1c were in areas seeded by the project biologists. In PMA subunit 1-2b (Rice Canyon) 1,025 of the 12,568 thornmint individuals were in newly seeded areas. The thornmints in all three PMA subunits that were seeded, totaled 1,697 plants in the newly created populations (Photographs 44–45).

After implementation of the dethatching and two years of the follow up spraying program, there has been an increase of 113,271 Otay tarplant individuals between 2011 and 2013. In PMA 1-1a, a total of 7,107 individuals were estimated in 2011, and 19,817 individuals were estimated in 2013. In PMA 1-1c, total of 92 individuals were estimated in 2011, and 1,961 individuals were estimated in 2013. In PMA 1-2b, a total of 33,731 individuals were estimated in 2011, and 132,423 individuals were estimated in 2013. These increases in population numbers from the 2011 baseline condition occurred despite below average rainfall in 2012–13. Variegated dudleya numbers have also increased from the baseline condition. There were an estimated 15 plants in 2011 and in 2013 the number of estimated dudleya has risen to 1,127.

Native Grass Establishment

The beneficial rains that occurred after the purple needlegrass individuals were planted enabled the plants to become established in the native soil. Although herbivory was noted on many of the planted grasses, qualitative observations of the grass during the growing season indicated that the plants were responding to the herbivory by growing new shoots. In a few cases the native grasses were established enough to flower in their first season (Photograph 46). Qualitative observation of the native grass growth will continue in the third year of the project.

Potential Pollinator Observations

Various potential pollinators were observed visiting Otay tarplant and associated native species included flies, beetles and skippers (Photographs 47–48).

Future Restoration and Enhancement Tasks

Non-natives will continue to be controlled in Year 3. Vegetation sampling and Otay tarplant, San Diego thornmint and variegated dudleya population estimates will be repeated in the spring of 2014. If you have any questions regarding the Otay tarplant and San Diego thornmint habitat restoration and enhancement program, do not hesitate to call.

Sincerely,

Mark W. Dodero

Mark Dodero
Senior Biologist

MWD:eab

Enclosures

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California Native Plant Society (CNPS)
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2003 Multiple Species Conservation Plan Subarea Plan. February.

Reiser, C. H.
2001 *Rare Plants of San Diego County.* Aquifir Press, Imperial Beach, CA.

Contributers to this Report

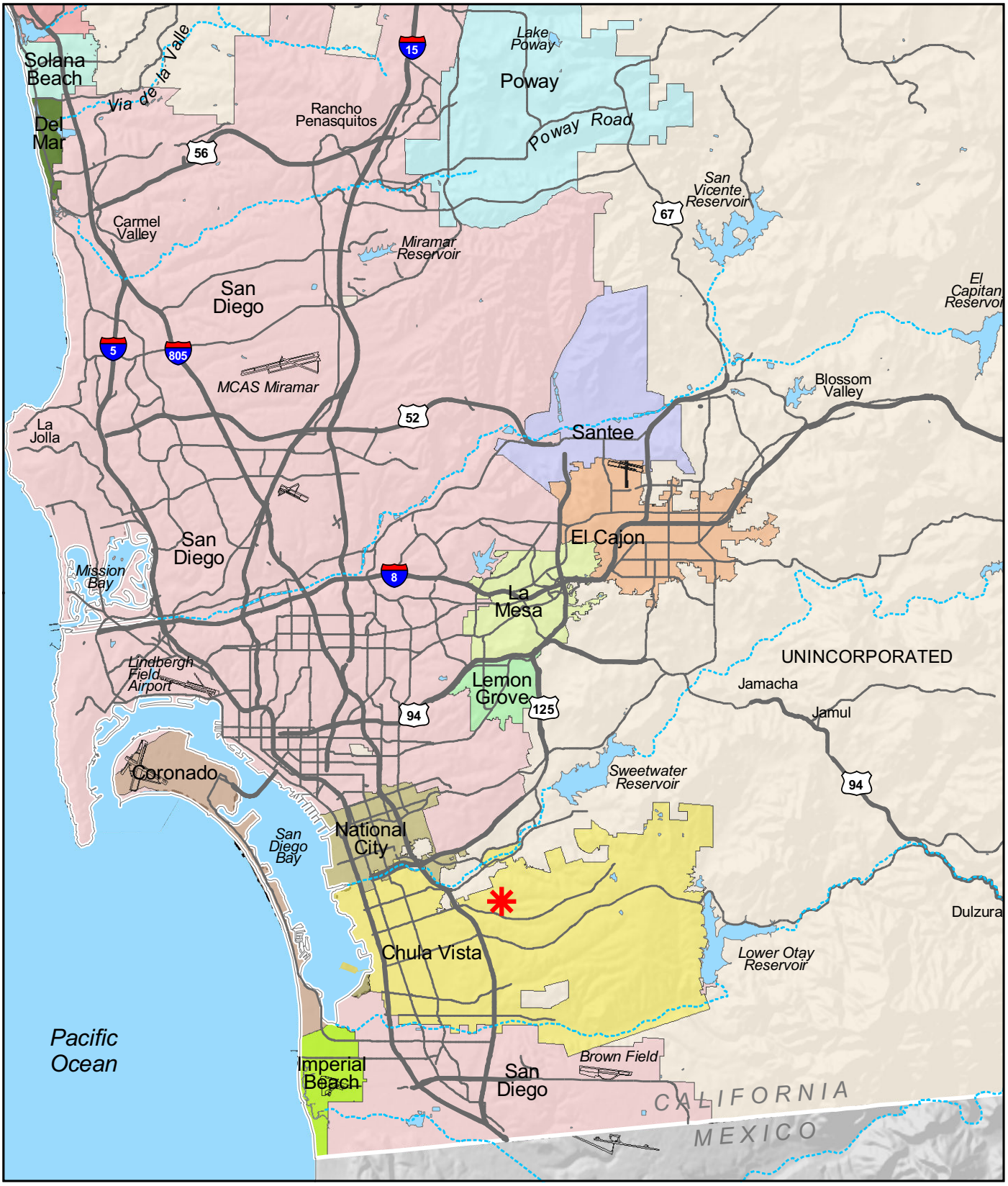
RECON biologists that conducted field surveys, analyzed data, and provided photographs included Anna Bennett, Cailin O'Meara, JR Sundberg, and Mark Dodero. Graphics and Production staff included Sean Bohac and Chris Nixon.

ATTACHMENTS

ATTACHMENT 1

Figures and Photographs

Figures



Project Location

FIGURE 1

Regional Location

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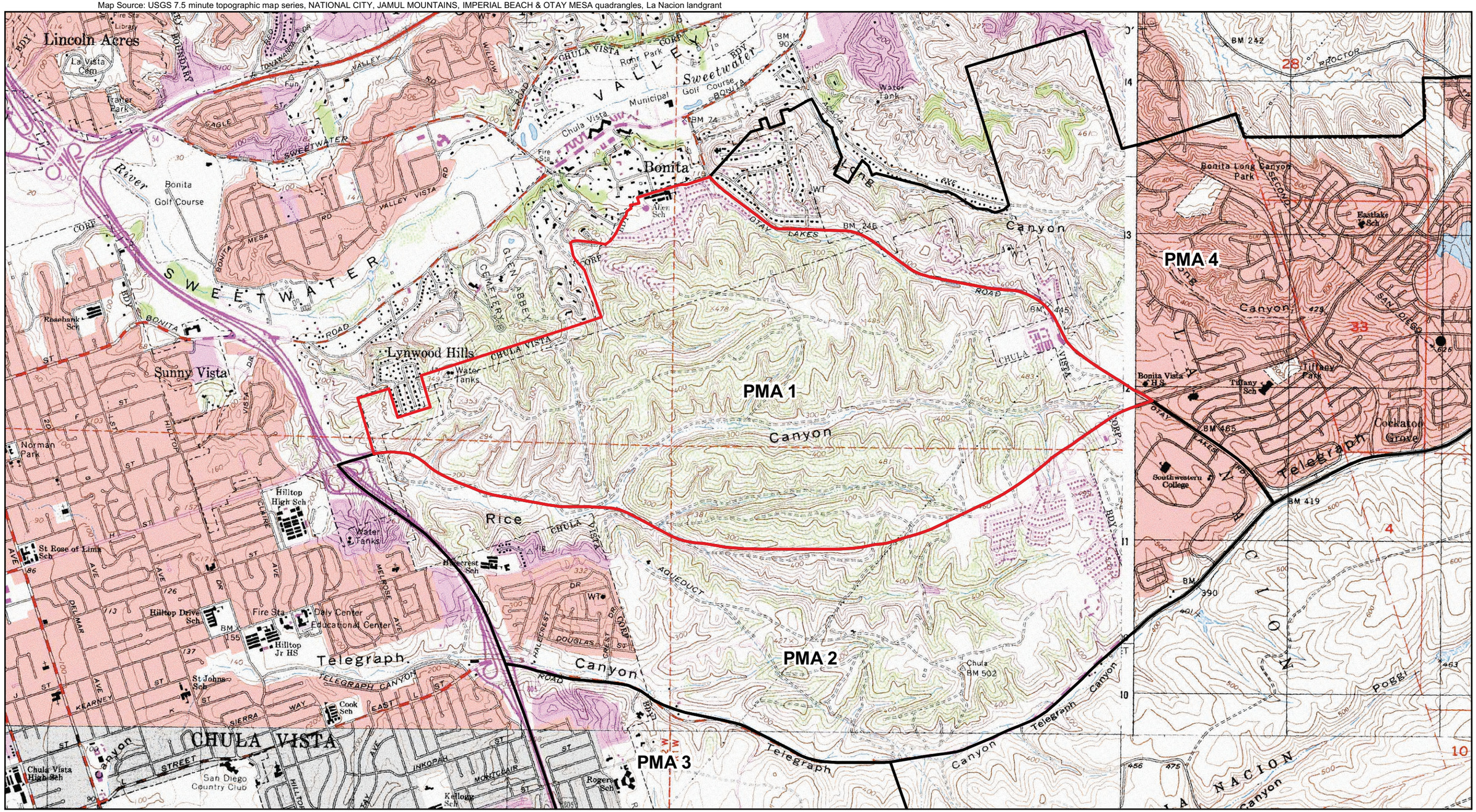
Map Source: USGS 7.5 minute topographic map series, NATIONAL CITY, JAMUL MOUNTAINS, IMPERIAL BEACH & OTAY MESA quadrangles, La Nacion landgrant



Preserve Management Areas

- PMA 1
- Other PMAs

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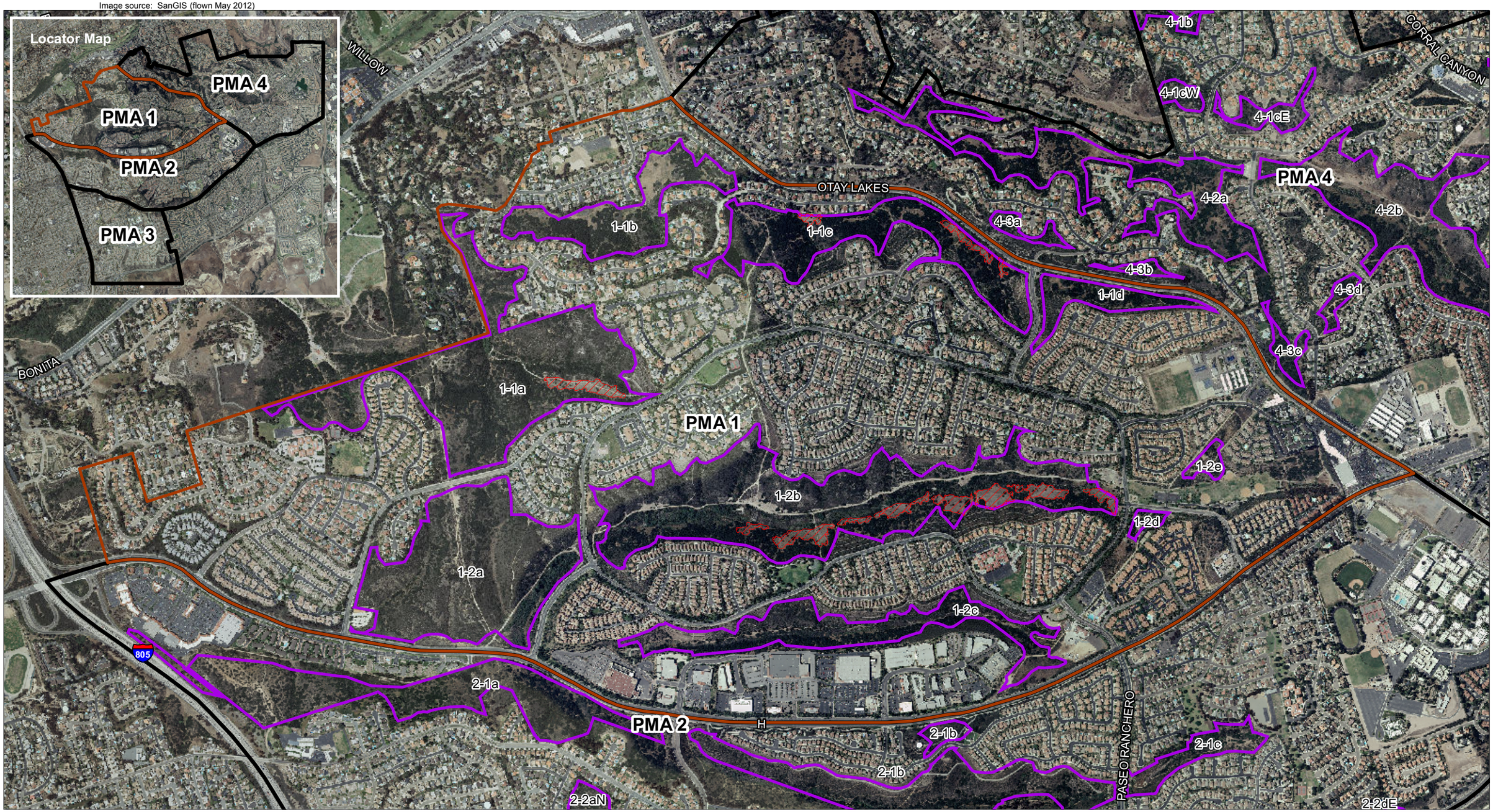
FIGURE 2

Project Location on USGS Map

Image source: SanGIS (flown May 2012)



PMA 1

Other PMAs

PMA Subunits

Dethatching Areas

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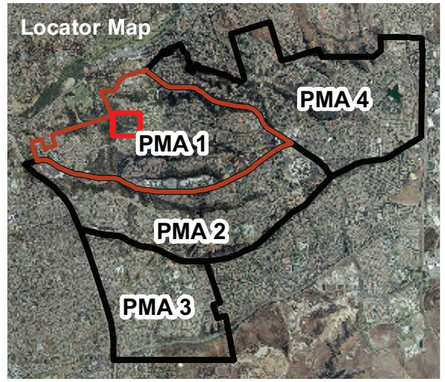
FIGURE 3

Preserve Management Subunits Selected for Restoration and Enhancement

Image source: SanGIS (flown May 2012)



PMA Subunits

Dethatching Areas

Deinandra conjugens

Harpogenella palmeri

Ferocactus viridescens

Acanthomintha ilicifolia Seeding Area

0 Feet 150

FIGURE 4a

PMA 1-1a 2013 Sensitive Plant Species

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Image source: SanGIS (flown May 2012)

PMA Subunits

Dethatching Areas

Deinandra conjugens

Acanthomintha ilicifolia Seeding Area

FIGURE 4b

PMA 1-1c 2013 Sensitive Plant Species

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Image source: SanGIS (flown May 2012)

PMA Subunits

Dethatching Areas

Deinandra conjugens

Dudleya variegata

Acanthomintha ilicifolia Natural Population

FIGURE 4c.1

PMA 1-2b West 2013 Sensitive Plant Species

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Image source: SanGIS (flown May 2012)

PMA Subunits

Dethatching Areas

Deinandra conjugens

Dudleya variegata

Harpagonella palmeri

Acanthomintha ilicifolia Natural Population

Acanthomintha ilicifolia Seeded Area

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FIGURE 4c.2

PMA 1-2b East 2013 Sensitive Plant Species

Photographs

PHOTOGRAPH 1
Otay Tarplant

PHOTOGRAPH 2
San Diego Thornmint

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PHOTOGRAPH 3
Variegated Dudleya

PHOTOGRAPH 4
Small-flowered Morning Glory

PHOTOGRAPH 5
San Diego Thornmint Seeding Area Rice Canyon

PHOTOGRAPH 6
San Diego Thornmint Seedlings Observed Early January 2013

PHOTOGRAPH 7
RECON Crews Collected and Redistributed
Seed Under Supervision of Biologists

PHOTOGRAPH 8
RECON Crews Installed
Preserve Signs in Rice Canyon

PHOTOGRAPH 9
Preserve Sign in Rice Canyon

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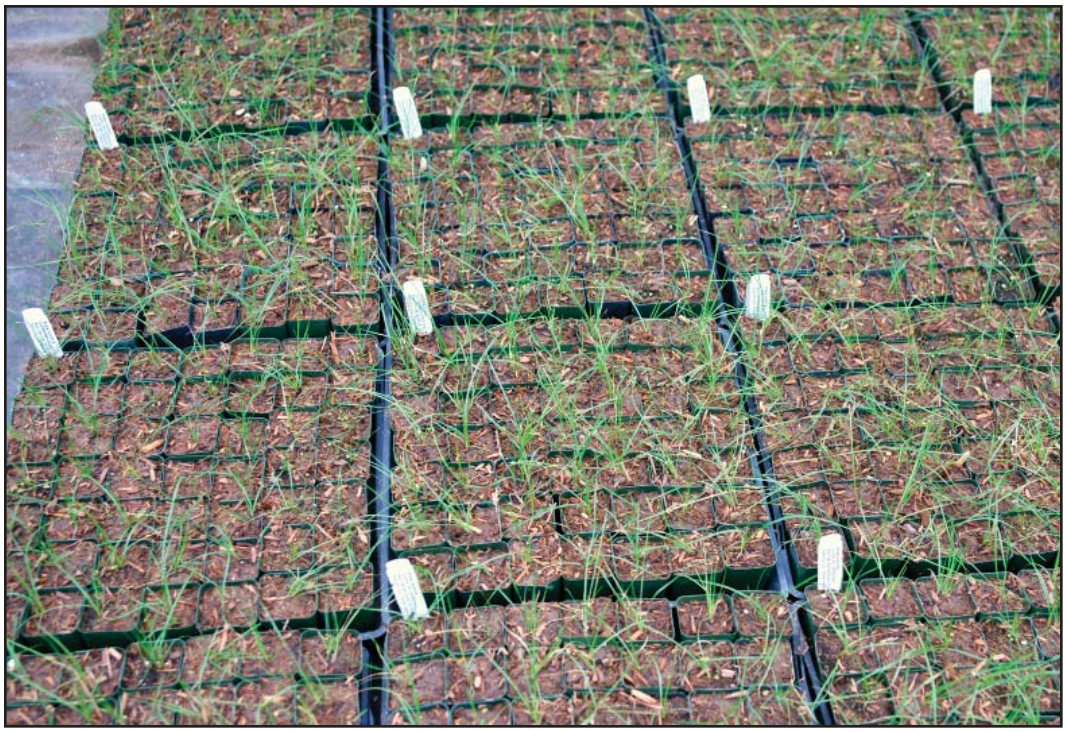
PHOTOGRAPH 10
RECON Crews Used Weed Whips to Cut Mustard Flowers in Areas Occupied by Tarplant and Thornmint

PHOTOGRAPH 11
Otay Tarplant Seedling Locations Flagged Prior to Spraying

PHOTOGRAPH 12
RECON Crews Spraying Non-natives

PHOTOGRAPH 13
Non-native Grasses Immediately After Spraying



PHOTOGRAPH 14
Purple Needlegrass Growing at the Nursery, October 2012

PHOTOGRAPH 15
Purple Needlegrass Just Prior to Planting, January 2013

PHOTOGRAPH 16
RECON Crews Excavating Planting Holes for Native Grasses

PHOTOGRAPH 17
RECON Crews Planting Native Grasses

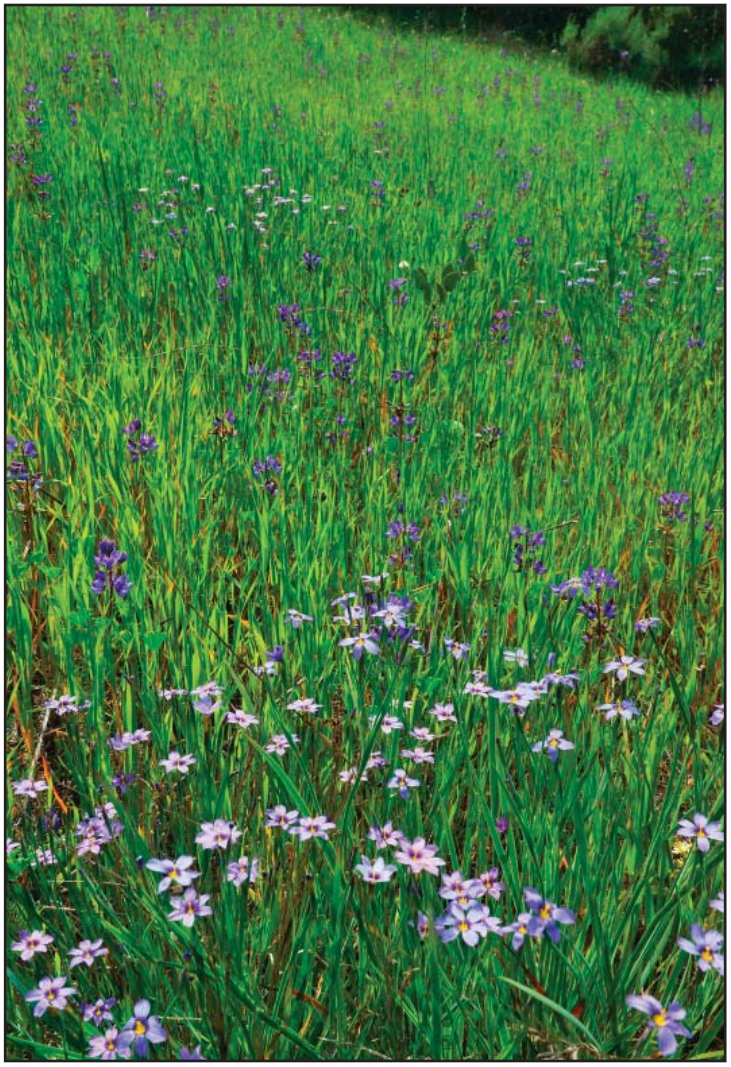
PHOTOGRAPH 18
Purple Needlegrass After Late January Rainfall

PHOTOGRAPH 19
Natural Population of Flowering San Diego Thornmint

PHOTOGRAPH 20
Flowering Otay Tarplant Rice Canyon

PHOTOGRAPH 21
Gumplant Leaves Emerged After December Rainfall

PHOTOGRAPH 22
Miner's Lettuce



PHOTOGRAPH 23
Flowering Blue-eyed Grass and Arroyo Lupines

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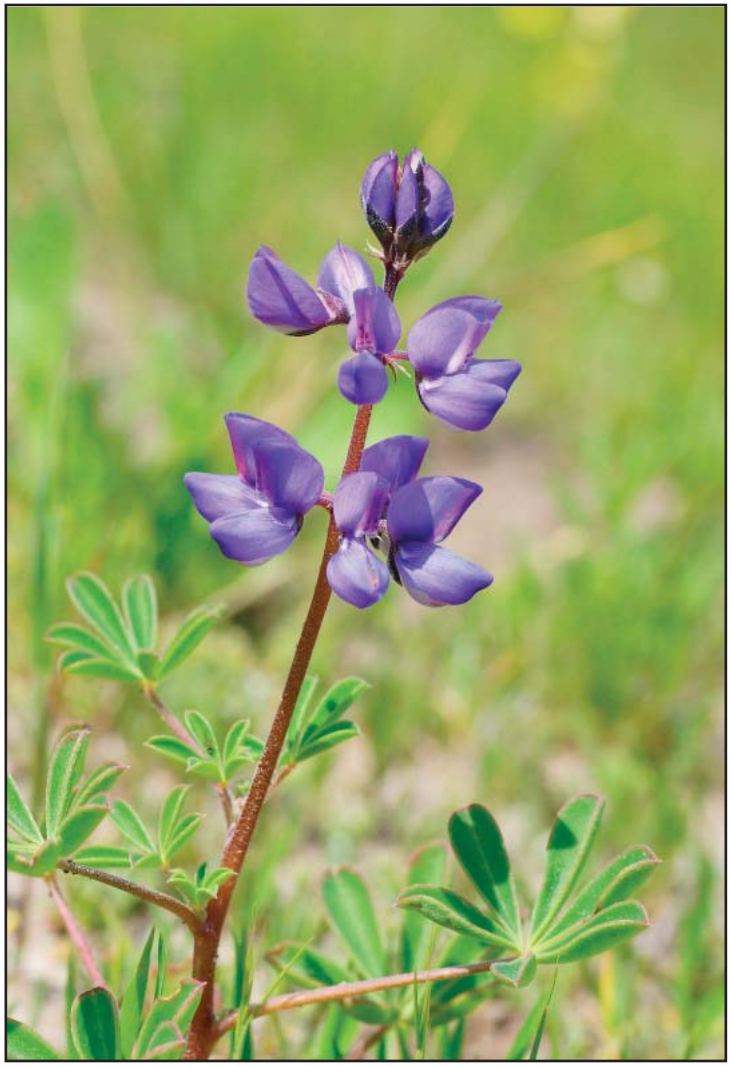

PHOTOGRAPH 24
Flowering Arroyo Lupine

PHOTOGRAPH 25
Flowering Death Camas

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PHOTOGRAPH 26
Flowering Wild Onion

PHOTOGRAPH 27
Flowering Common Goldenstar

PHOTOGRAPH 28
Flowering Common Goldenstar

PHOTOGRAPH 29
Flowering Lilac Mariposa

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PHOTOGRAPH 30
Rice Canyon Area Prior to Implementation, October 2011

PHOTOGRAPH 31
Same Rice Canyon Area in Year 2, June 2013

PHOTOGRAPH 32
Otay Tarplant Seedling, January 2013

PHOTOGRAPH 33
San Diego Thornmint Seedlings, January 2013

PHOTOGRAPH 34
Different Age Classes of Otay Tarplant Seedlings, February 2013

PHOTOGRAPH 35
Different Age Classes of San Diego Thornmint Seedlings, February 2013

PHOTOGRAPH 36
Newly Germianted Seedling of Small-flowered Morning Glory

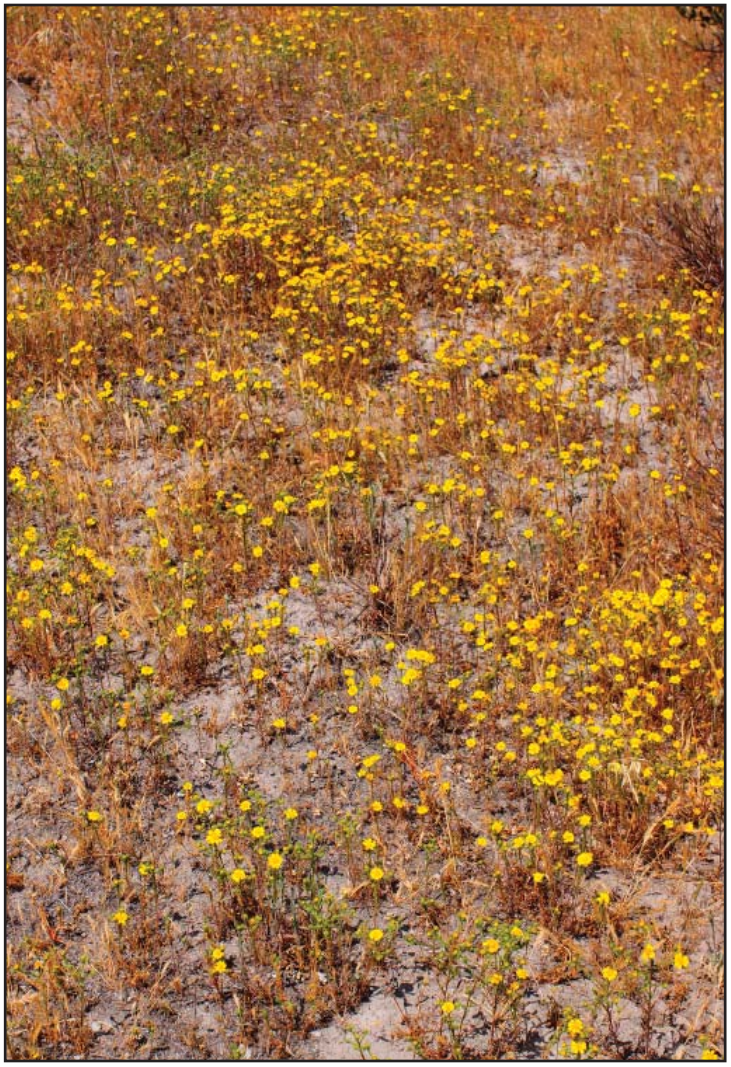
PHOTOGRAPH 37
Variegated Dudleya Responds Quickly to Heavy Rainfall, January 2013

PHOTOGRAPH 38
San Diego Thornmint Began
Flowering in Mid-March

PHOTOGRAPH 39
San Diego Thornmint Completed
Flowering in May 2013

RECON

PHOTOGRAPH 40
Otay Tarplant Flowering in
Rice Canyon, April 2013



PHOTOGRAPH 41
Otay Tarplant Flowering in
PMA Subunit 1-1a, May 2013

RECON

PHOTOGRAPH 42
Otay Tarplant Flowering in PMA Subunit 1-1c, May 2013

PHOTOGRAPH 43
Otay Tarplant and Variegated Dudleya
Flowering in Rice Canyon, May 2013

PHOTOGRAPH 44
Seeded San Diego Thornmint
Flowering in Rice Canyon

PHOTOGRAPH 45
Seeded San Diego Thornmint in PMA Subunit 1-1a

PHOTOGRAPH 46
Planted Purple Neeedlegrass
Flowering in its First Year

PHOTOGRAPH 47
Fly Visiting an Otay Tarplant Flower, Rice Canyon

PHOTOGRAPH 48
Skipper Nectaring on Wild Onion

ATTACHMENT 2

Species Observed within Restoration and Enhancement Areas during Relevé Sampling

ATTACHMENT 2
PLANT SPECIES OBSERVED WITHIN THE OTAY TARPLANT AND SAN DIEGO THORNMINT RESTORATION AND ENHANCEMENT AREAS

Scientific Name	Common Name	Origin	Sensitivity	Preserve Management Unit
	LYCOPODS			
SELAGINELLACEAE	**SPIKE-MOSS FAMILY**			
Selaginella cinerascens A.A. Eaton	ashy spike-moss	N	CNPS 4.1	PMA 1-2b
	FERNS			
PTERIDACEAE	**BRAKE FAMILY**			
Pentagramma triangularis (Kaulf.) Yatsk. Windham & E. Wollenw.	goldback fern	N	-	PMA 1-1a
	ANGIOSPERMS: MONOCOTS			
AGAVACEAE	**AGAVE FAMILY**			
Chlorogalum parviflorum S. Watson	smallflower soap plant	N	-	PMA 1-2b; 1-1a; 1-1c
ALLIACEAE	**ONION FAMILY**			
Allium praecox Brandegee	common wild onion	N	-	PMA 1-1a; 1-1c; 1-2b
ARECACEAE	**PALM FAMILY**			
Washingtonia robusta H. Wendl.	Washington fan palm	I	-	PMA 1-1c
IRIDACEAE	**IRIS FAMILY**			
Sisyrinchium bellum S. Watson	western blue-eyed-grass	N	-	PMA 1-1a; 1-1c; 1-2b
LILIACEAE	**LILY FAMILY**			
Calochortus sp.	Mariposa lily, fairy lantern, globe lily	N	-	PMA 1-1a
Calochortus splendens Benth.	lilac mariposa	N	-	PMA 1-2b
MELANTHIACEAE	**BUNCH FLOWER OR CAMAS FAMILY**			
Toxicoscordion [=*Zigadenus*] *fremontii* (Torr.) Rydb.	Fremont's camas	N	-	PMA 1-2b; 1-1a
POACEAE (GRAMINEAE)	**GRASS FAMILY**			
Agrostis pallens Trin.	dune bentgrass	N	-	PMA 1-2b
Avena barbata Link	slender wild oat	I	-	PMA 1-1a; 1-1c; 1-2b
Avena fatua L.	wild oat	I	-	PMA 1-1a; 1-2b; 1-1c
Brachypodium distachyon (L.) P. Beauv.	purple falsebrome	I	-	PMA 1-1c; 1-2b; 1-1a

ATTACHMENT 2
PLANT SPECIES OBSERVED WITHIN THE OTAY TARPLANT AND SAN DIEGO THORNMINT RESTORATION AND ENHANCEMENT AREAS (CONT.)

Scientific Name	Common Name	Origin	Sensitivity	Preserve Management Unit
Bromus diandrus Roth	ripgut grass	I	-	PMA 1-1a; 1-2b
Bromus hordeaceus L.	soft chess	I	-	PMA 1-1a; 1-2b; 1-1c
Bromus madritensis L. ssp. *rubens* (L.) Husnot	red brome	I	-	PMA 1-2b; 1-1c; 1-1a
Bromus sterilis L.	poverty brome	I	-	PMA 1-2b; 1-1a; 1-1c
Festuca bromoides L.	brome fescue	I	-	PMA 1-2b
Festuca [=*Vulpia*] *myuros* L.	rat-tail fescue	I	-	PMA 1-1a; 1-1c; 1-2b
Gastridium ventricosum (Gouan) Schinz & Thell.	nit grass	I	-	PMA 1-1a; 1-1c; 1-2b
Festuca perennis (L.) Columbus & J.P. Sm. [=*Lolium multiflorum*]	rye grass	I	-	PMA 1-1a; 1-2b; 1-1c
Melica imperfecta Trin.	California melic	N	-	PMA 1-1c
Phalaris sp.	Canary grass	I	-	PMA 1-2b
Stipa [=*Nassella*] *lepida* (Hitchc.) Barkworth	foothill needlegrass	N	-	PMA 1-1a; 1-1c; 1-2b
Stipa [=*Nassella*] *pulchra* (Hitchc.) Barkworth	purple needlegrass	N	-	PMA 1-1a; 1-1c; 1-2b
THEMIDACEAE	**BRODIAEA FAMILY**			
Bloomeria crocea (Torr.) Coville	common goldenstar	N	-	PMA 1-1a; 1-1c; 1-2b
Brodiaea terrestris Kellogg ssp. *kernensis* (Hoover) T.F. Niehaus	dwarf brodiaea	N	-	PMA 1-2b
Dichelostemma capitatum (Benth.) A.W. Wood	blue dicks	N	-	PMA 1-1a; 1-2b; 1-1c
	ANGIOSPERMS: DICOTS			
ANACARDIACEAE	**SUMAC OR CASHEW FAMILY**			
Rhus integrifolia (Nutt.) Benth. & Hook. f. ex Rothr.	lemonadeberry	N	-	PMA 1-1a; 1-2b; 1-1c
APIACEAE (UMBELLIFERAE)	**CARROT FAMILY**			
Apiastrum angustifolium Nutt.	wild-celery	N	-	PMA 1-2b
Daucus pusillus Michx.	rattlesnake weed	N	-	PMA 1-1c; 1-2b; 1-1a
Foeniculum vulgare Mill.	fennel	I	-	PMA 1-1a; 1-1c; 1-2b
ASTERACEAE	**SUNFLOWER FAMILY**			
Ambrosia psilostachya DC.	western ragweed	N	-	PMA 1-2b
Artemisia californica Less.	California sagebrush	N	-	PMA 1-1a; 1-1c; 1-2b
Baccharis sarothroides A. Gray	broom baccharis	N	-	PMA 1-2b; 1-1c
Carduus pycnocephalus L.	Italian thistle	I	-	PMA 1-1a; 1-1c; 1-2b
Centaurea melitensis L.	tocalote, Maltese star-thistle	I	-	PMA 1-1a; 1-1c; 1-2b

ATTACHMENT 2
PLANT SPECIES OBSERVED WITHIN THE OTAY TARPLANT AND SAN DIEGO THORNMINT RESTORATION AND ENHANCEMENT AREAS (CONT.)

Scientific Name	Common Name	Origin	Sensitivity	Preserve Management Unit
Corethrogyne filaginifolia (Hook. & Arn.) Nutt.	sand-aster	N	-	PMA 1-1a; 1-1c; 1-2b
Cynara cardunculus L.	cardoon, artichoke thistle	I	-	PMA 1-2b
Deinandra [=*Hemizonia*] *conjugens* (D.D. Keck) B.G. Baldwin	Otay tarplant	N	CE/FT, MSCP NE/4-1, CNPS 1B.1	PMA 1-1a; 1-2b; 1-1c
Encelia californica Nutt.	common encelia	N	-	PMA 1-1a
Erigeron [=*Conyza*] *canadensis* (L.) Cronquist	horseweed	N	-	PMA 1-1a
Eriophyllum confertiflorum (DC.) A. Gray var. *confertiflorum*	golden-yarrow	N	-	PMA 1-1a; 1-1c
Glebionis coronaria (L.) Spach [=*Chrysanthemum coronarium*]	garland, crown daisy	I	-	PMA 1-1a; 1-2b
Grindelia camporum Greene	gumplant	N	-	PMA 1-1a; 1-1c; 1-2b
Hazardia squarrosa (Hook. & Arn.) Greene	saw-toothed goldenbush	N	-	PMA 1-1a; 1-2b
Hedypnois cretica (L.) Dum. Cours.	crete weed	I	-	PMA 1-1a; 1-2b; 1-1c
Helminthotheca [=*Picris*] *echioides* (L.) Holub	bristly ox-tongue	I	-	PMA 1-1c; 1-2b
Hesperevax sparsiflora (A. Gray) Greene	erect evax	N	-	PMA 1-1a; 1-2b
Hypochaeris glabra L.	smooth cat's-ear	I	-	PMA 1-2b; 1-1c
Isocoma menziesii (Hook. & Arn.) G.L. Nesom var. *decumbens* (Greene) G.L. Nesom	decumbent goldenbush	N	CNPS 1B.2	PMA 1-1a; 1-1c; 1-2b
Lactuca serriola L.	prickly lettuce	I	-	PMA 1-1a; 1-2b; 1-1c
Logfia [=*Filago*] *gallica* (L.) Cross. & Germ.	narrow-leaf herba impia	I	-	PMA 1-2b; 1-1a
Matricaria discoidea [=*Chamomilla suaveolens*] DC.	pineapple weed, rayless chamomile	I	-	PMA 1-1a
Microseris douglasii (DC.) Sch. Bip. var. *platycarpha* (A. Gray) B.L. Turner	small-flowered microseris	N	CNPS 4.2	PMA 1-2b; 1-1a
Osmadenia tenella Nutt.	osmadenia	N	-	PMA 1-1a; 1-1c; 1-2b
Pseudognaphalium biolettii Anderb.	bicolor cudweed	N	-	PMA 1-1c
Pseudognaphalium californicum (DC.) Anderb.	green everlasting	N	-	PMA 1-1a
Psilocarphus tenellus Nutt.	slender woolly marbles	N	-	PMA 1-1a
Senecio sp. [probably undescribed taxon similar to *S. linearifolius,* currently being studied by Brant Primrose (Rebman and Simpson 2006)]	groundsel	I	-	PMA 1-2b
Silybum marianum (L.) Gaertn.	milk thistle	I	-	PMA 1-2b
Sonchus asper (L.) Hill ssp. *asper*	prickly sow thistle	I	-	PMA 1-1a; 1-1c; 1-2b
Sonchus oleraceus L.	common sow thistle	I	-	PMA 1-1a; 1-2b
Stylocline gnaphaloides Nutt.	everlasting nest straw	N	-	PMA 1-1a

ATTACHMENT 2
PLANT SPECIES OBSERVED WITHIN THE OTAY TARPLANT AND SAN DIEGO THORNMINT RESTORATION AND ENHANCEMENT AREAS (CONT.)

Scientific Name	Common Name	Origin	Sensitivity	Preserve Management Unit
BORAGINACEAE	**BORAGE FAMILY**			
Harpagonella palmeri A. Gray	Palmer's grapplinghook	N	CNPS 4.2	PMA 1-2b; 1-1a
BRASSICACEAE (CRUCIFERAE)	**MUSTARD FAMILY**			
Brassica nigra (L.) W.D.J. Koch	black mustard	I	-	PMA 1-1a; 1-1c; 1-2b
CACTACEAE	**CACTUS FAMILY**			
Cylindropuntia [=*Opuntia*] *prolifera* (Engelm.) F.M. Knuth	coastal cholla	N	-	PMA 1-1a; 1-2b; 1-1c
Ferocactus viridescens (Torr. & A. Gray) Britton & Rose	San Diego barrel cactus	N	CNPS 2.1, MSCP 4-1	PMA 1-1a
Opuntia ficus-indica (L.) Mill.	Indian fig	I	-	PMA 1-1c
Opuntia littoralis (Engelm.) Cockerell.	shore cactus	N	-	PMA 1-1a; 1-1c; 1-2b
Opuntia oricola Philbrick	chaparral prickly-pear	N	-	PMA 1-2b; 1-1c
CARYOPHYLLACEAE	**PINK FAMILY**			
Cerastium glomeratum Thuill	mouse-ear chickweed	I	-	PMA 1-1c
Silene gallica L.	windmill pink	N	-	PMA 1-2b
CHENOPODIACEAE	**GOOSEFOOT FAMILY**			
Atriplex glauca L.	grey saltbush	I	-	PMA 1-1a
Atriplex semibaccata R. Br.	Australian saltbush	I	-	PMA 1-1a; 1-1c; 1-2b
Salsola tragus L.	Russian thistle, tumbleweed	I	-	PMA 1-1a; 1-2b; 1-1c
CLEOMACEAE	**SPIDERFLOWER FAMILY**			
Peritoma [=*Isomeris*] *arborea* Nutt.	bladderpod	N	-	PMA 1-1a; 1-2b; 1-1c
CONVOLVULACEAE	**MORNING-GLORY FAMILY**			
Calystegia macrostegia (Greene) Brummitt	chaparral morning-glory	N	-	PMA 1-2b; 1-1c
Convolvulus simulans L.M. Perry	small-flowered morning glory	N	CNPS 4.2	PMA 1-1a; 1-2b; 1-1c
Cuscuta californica Hook. & Arn.	dodder	N	-	PMA 1-1a; 1-2b
CRASSULACEAE	**STONECROP FAMILY**			
Crassula connata (Ruiz & Pav.) A. Berger	pygmy-weed	N	-	PMA 1-1a
Dudleya variegata (S. Watson) Moran	variegated dudleya	N	MSCP NE/4-1, CNPS 1B.2	PMA 1-2b
EUPHORBIACEAE	**SPURGE FAMILY**			
Euphorbia [=*Chamaesyce maculata*] L.	spotted spurge	I	-	PMA 1-2b
Euphorbia peplus L.	petty spurge	I	-	PMA 1-1a; 1-2b; 1-1c

ATTACHMENT 2
PLANT SPECIES OBSERVED WITHIN THE OTAY TARPLANT AND SAN DIEGO THORNMINT RESTORATION AND ENHANCEMENT AREAS (CONT.)

Scientific Name	Common Name	Origin	Sensitivity	Preserve Management Unit
FABACEAE (LEGUMINOSAE)	**LEGUME FAMILY**			
Lupinus concinnus J. Agardh	bajada lupine	N	-	PMA 1-2b
Lupinus succulentus K. Koch	arroyo lupine	N	-	PMA 1-2b; 1-1a
Lupinus truncatus Nutt.	chaparral lupine	N	-	PMA 1-2b
Medicago polymorpha L.	California bur clover	I	-	PMA 1-2b; 1-1c
Melilotus albus Medik.	white sweetclover	I	-	PMA 1-2b
Melilotus indicus (L.) All.	sourclover	I	-	PMA 1-1a; 1-2b
FAGACEAE	**OAK FAMILY**			
Quercus engelmannii Greene	Engelmann oak, mesa oak	N	CNPS 4.2	PMA 1-2b
GENTIANACEAE	**GENTIAN FAMILY**			
Zeltnera [=*Centaurium*] *venusta* (A. Gray) G. Mans.	canchalagua	N	-	PMA 1-1a; 1-1c; 1-2b
GERANIACEAE	**GERANIUM FAMILY**			
Erodium botrys (Cav.) Bertol.	long-beak filaree	I	-	PMA 1-1c; 1-2b
Erodium cicutarium (L.) L'Hér. ex Aiton	red stemmed filaree	I	-	PMA 1-1a; 1-1c; 1-2b
LAMIACEAE	**MINT FAMILY**			
Acanthomintha ilicifolia (A. Gray) A. Gray	San Diego thornmint	N	CE/FT, MSCP NE/4-2, CNPS 1B.1	PMA 1-2b; 1-1c; 1-1a
Salvia apiana Jeps.	white sage	N	-	PMA 1-1c
Stachys ajugoides Benth. var. *rigida* (Nutt. ex Benth.) Jeps. & Hoover	hedge nettle	N	-	PMA 1-2b
MALVACEAE	**MALLOW FAMILY**			
Sidalcea malviflora (DC.) Gray ex Benth.	checker-bloom	N	-	PMA 1-2b
MYRSINACEAE				
Anagallis arvensis L.	scarlet pimpernel, poor-man's weatherglass	I	-	PMA 1-1a; 1-1c; 1-2b
PLANTAGINACEAE	**PLANTAIN FAMILY**			
Plantago erecta E. Morris	dot-seed plantain	N	-	PMA 1-2b; 1-1a
Plantago coronopus L.	cut-leaf plantain	I	-	PMA 1-1a
Plantago virginica L.	dwarf plantain	I	-	PMA 1-2b; 1-1c
POLYGONACEAE	**BUCKWHEAT FAMILY**			
Eriogonum fasciculatum Benth.	California buckwheat	N	-	PMA 1-1a; 1-1c; 1-2b

ATTACHMENT 2
PLANT SPECIES OBSERVED WITHIN THE OTAY TARPLANT AND SAN DIEGO THORNMINT RESTORATION AND ENHANCEMENT AREAS (CONT.)

Scientific Name	Common Name	Origin	Sensitivity	Preserve Management Unit
Heteromeles arbutifolia (Lindl.) M. Roem.	toyon, Christmas berry	N	-	PMA 1-2b
PRIMULACEAE	**PRIMROSE FAMILY**			
Dodecatheon clevelandii Greene ssp. *clevelandii*	shooting star, wild cyclamen	N	-	PMA 1-1a; 1-2b
RUBIACEAE	**MADDER OR COFFEE FAMILY**			
Galium aparine L.	goose grass, stickywilly	N	-	PMA 1-1a; 1-1c
Galium nuttallii A. Gray	San Diego bedstraw	N	-	PMA 1-1c
SIMMONDSIACEAE	**JOJOBA FAMILY**			
Simmondsia chinensis (Link) C.K. Schneid.	jojoba, goat nut	N	-	PMA 1-1a; 1-2b; 1-1c
SOLANACEAE	**NIGHTSHADE FAMILY**			
Nicotiana glauca Graham	tree tobacco	I	-	PMA 1-2b

NOMENCLATURE FROM:

University of California
2012 The Jepson Online Interchange. Accessed September 2012 from http://ucjeps.berkeley.edu/interchange.html.

Rebman, John P., and Michael G. Simpson
2006 Checklist of the Vascular Plants of San Diego County, 4th edition. San Diego Natural History Museum.

ATTACHMENT 2
PLANT SPECIES OBSERVED WITHIN THE OTAY TARPLANT AND SAN DIEGO THORNMINT RESTORATION AND ENHANCEMENT AREAS (CONT.)

FEDERAL CANDIDATES AND LISTED SPECIES

FE = Federally listed endangered
FT = Federally listed threatened
FPT = Federally proposed (Threatened)

STATE LISTED SPECIES

CE = State listed endangered
CR = State listed rare
CT = State listed threatened
FP = CDFG fully protected species
SSC = CDFG species of special concern
WL = CDFG watch list species

CALIFORNIA NATIVE PLANT SOCIETY RARE PLANT RANKING

1A = Species presumed extinct.
1B = Species rare, threatened, or endangered in California and elsewhere. These species are eligible for state listing.
2 = Species rare, threatened, or endangered in California but more common elsewhere. These species are eligible for state listing.
3 = Species for which more information is needed. Distribution, endangerment, and/or taxonomic information is needed.
4 = A watch list of species of limited distribution. These species need to be monitored for changes in the status of their populations.
.1 = Species seriously threatened in California (over 80% of occurrences threatened; high degree and immediacy of threat)
.2 = Species fairly threatened in California (20-80% occurrences threatened; moderate degree and immediacy of threat)
.3 = Species not very threatened in California (<20% of occurrences threatened; low degree and immediacy of threat or no current threats known)
CBR = Considered but rejected
NA = Not applicable

CITY OF CHULA VISTA MSCP

NE = Narrow endemic
4-1 = Species adequately conserved (Table 4-1)
4-2 = Species with known occurrences or suitable habitat within *Chula Vista Subarea* (Table 4-2)
4-3 = Species not likely to be found in the *Chula Vista Subarea* (Table 4-3)

ORIGIN

N = Native to locality
I = Introduced species from outside locality